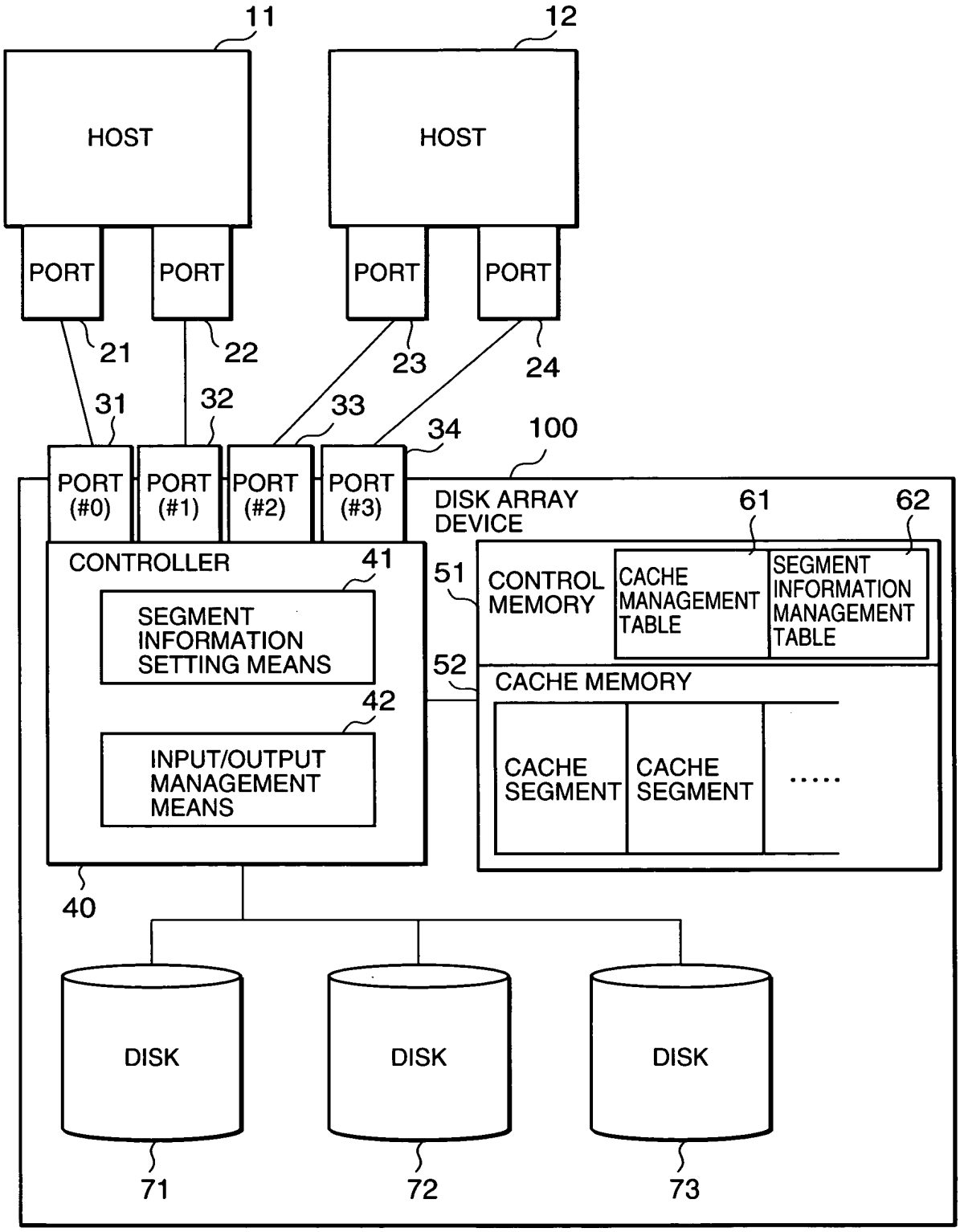
11
12
HOST
HOST
PORT
PORT
PORT
PORT
21
22
23
24
31
32
33
34
100
PORT (#0)
PORT (#1)
PORT (#2)
PORT (#3)
DISK ARRAY DEVICE
61
62
CONTROLLER
41
SEGMENT INFORMATION SETTING MEANS
42
INPUT/OUTPUT MANAGEMENT MEANS
51
CONTROL MEMORY
CACHE MANAGEMENT TABLE
SEGMENT INFORMATION MANAGEMENT TABLE
52
CACHE MEMORY
CACHE SEGMENT
CACHE SEGMENT
.....
40
DISK
DISK
DISK
71
72
73

FIG. 1

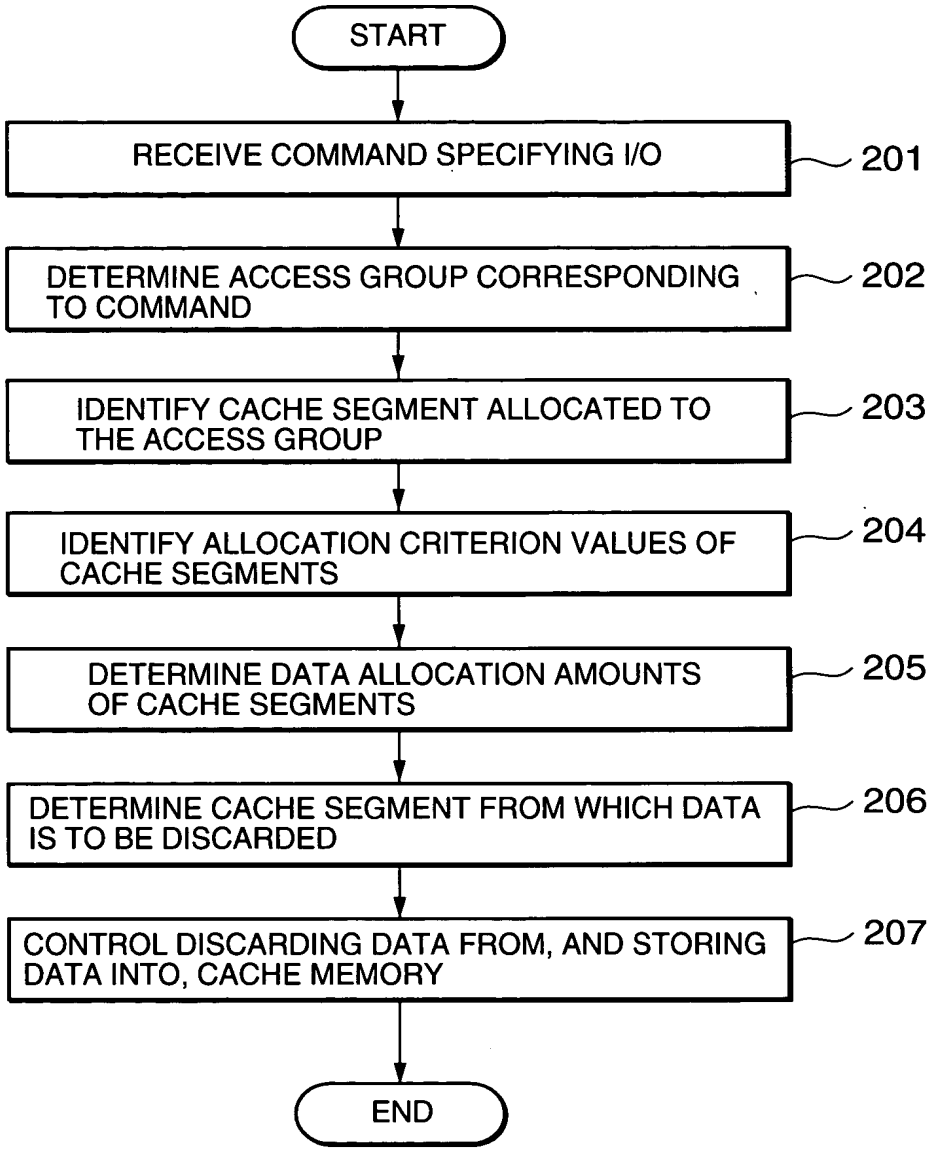
START
RECEIVE COMMAND SPECIFYING I/O
201
DETERMINE ACCESS GROUP CORRESPONDING TO COMMAND
202
IDENTIFY CACHE SEGMENT ALLOCATED TO THE ACCESS GROUP
203
IDENTIFY ALLOCATION CRITERION VALUES OF CACHE SEGMENTS
204
DETERMINE DATA ALLOCATION AMOUNTS OF CACHE SEGMENTS
205
DETERMINE CACHE SEGMENT FROM WHICH DATA IS TO BE DISCARDED
206
CONTROL DISCARDING DATA FROM, AND STORING DATA INTO, CACHE MEMORY
207
END

FIG. 2

62

SEGMENT INFORMATION MANAGEMENT TABLE

| SEGMENT MANAGEMENT TABLE | ALLOCATION CRITERION VALUE |
|---|---|
| CACHE SEGMENT #0 | 100 |
| CACHE SEGMENT #1 | 0 |
| CACHE SEGMENT #2 | 0 |
| CACHE SEGMENT #3 | 0 |

| PORT MANAGEMENT TABLE | CACHE SEGMENT NUMBER |
|---|---|
| PORT #0 | #0 |
| PORT #1 | #0 |
| PORT #2 | #0 |
| PORT #3 | #0 |

FIG. 3A

62

SEGMENT INFORMATION MANAGEMENT TABLE

| SEGMENT MANAGEMENT TABLE | ALLOCATION CRITERION VALUE |
|---|---|
| CACHE SEGMENT #0 | 70 |
| CACHE SEGMENT #1 | 30 |
| CACHE SEGMENT #2 | 0 |
| CACHE SEGMENT #3 | 0 |

| PORT MANAGEMENT TABLE | CACHE SEGMENT NUMBER |
|---|---|
| PORT #0 | #0 |
| PORT #1 | #0 |
| PORT #2 | #1 |
| PORT #3 | #1 |

FIG. 3B

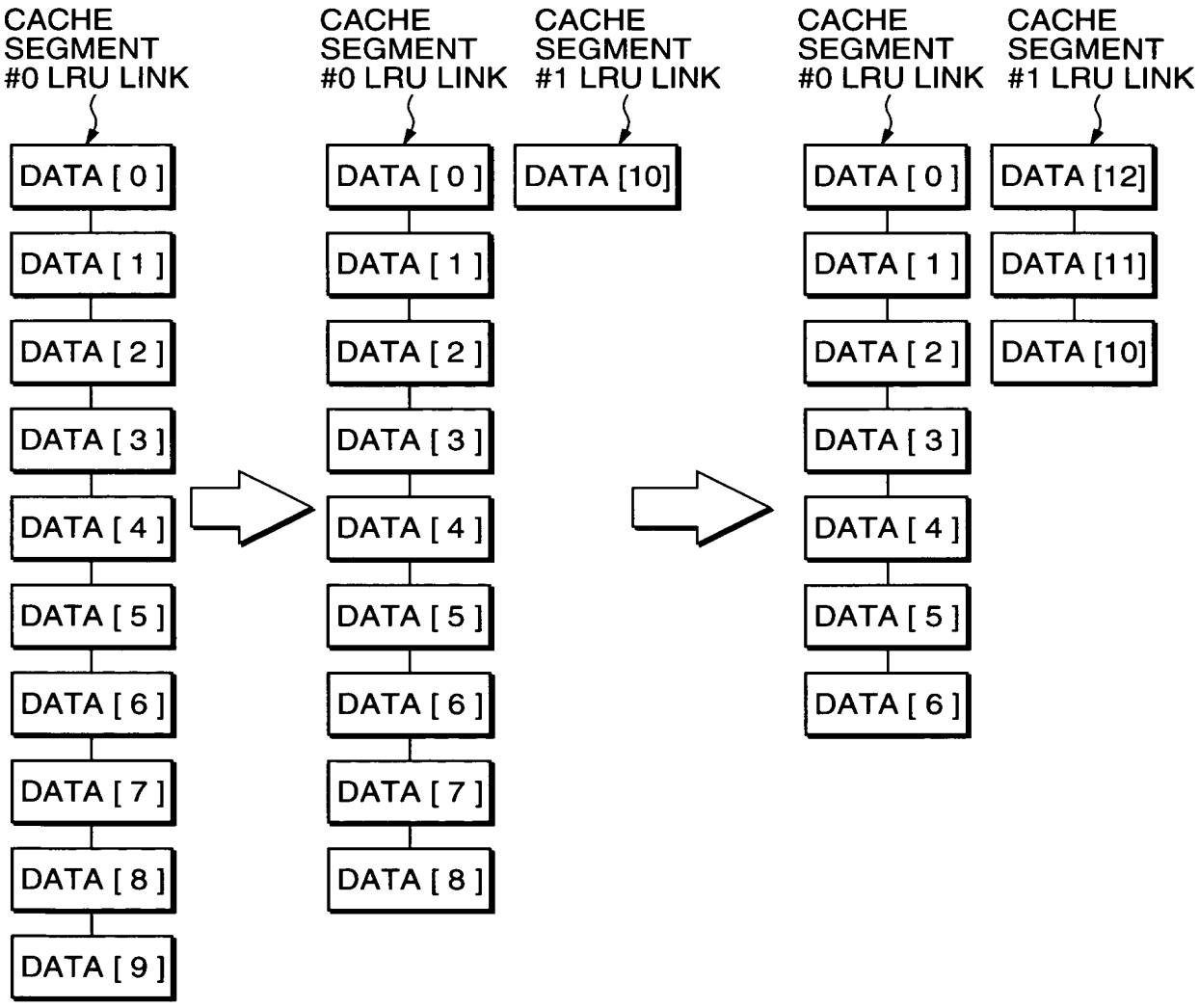


FIG. 4A FIG. 4B FIG. 4C

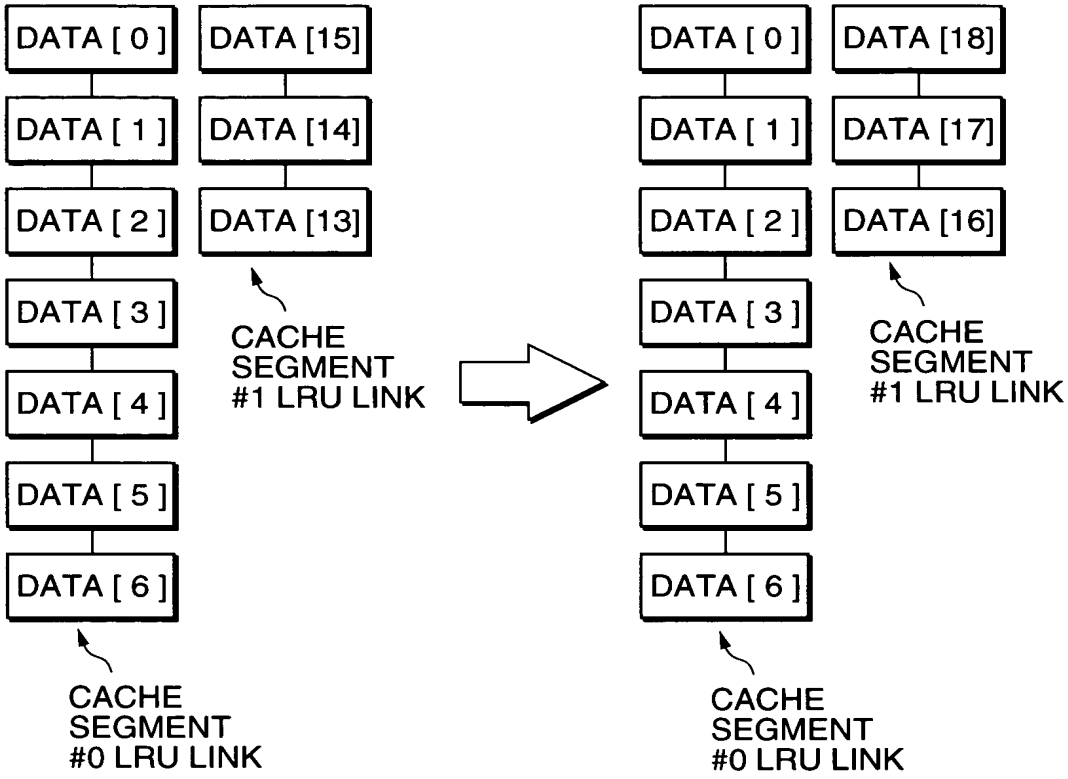
DATA [ 0 ]
DATA [ 1 ]
DATA [ 2 ]
DATA [ 3 ]
DATA [ 4 ]
DATA [ 5 ]
DATA [ 6 ]
DATA [15]
DATA [14]
DATA [13]
CACHE SEGMENT #1 LRU LINK
CACHE SEGMENT #0 LRU LINK
DATA [ 0 ]
DATA [ 1 ]
DATA [ 2 ]
DATA [ 3 ]
DATA [ 4 ]
DATA [ 5 ]
DATA [ 6 ]
DATA [18]
DATA [17]
DATA [16]
CACHE SEGMENT #1 LRU LINK
CACHE SEGMENT #0 LRU LINK

FIG. 5A

FIG. 5B

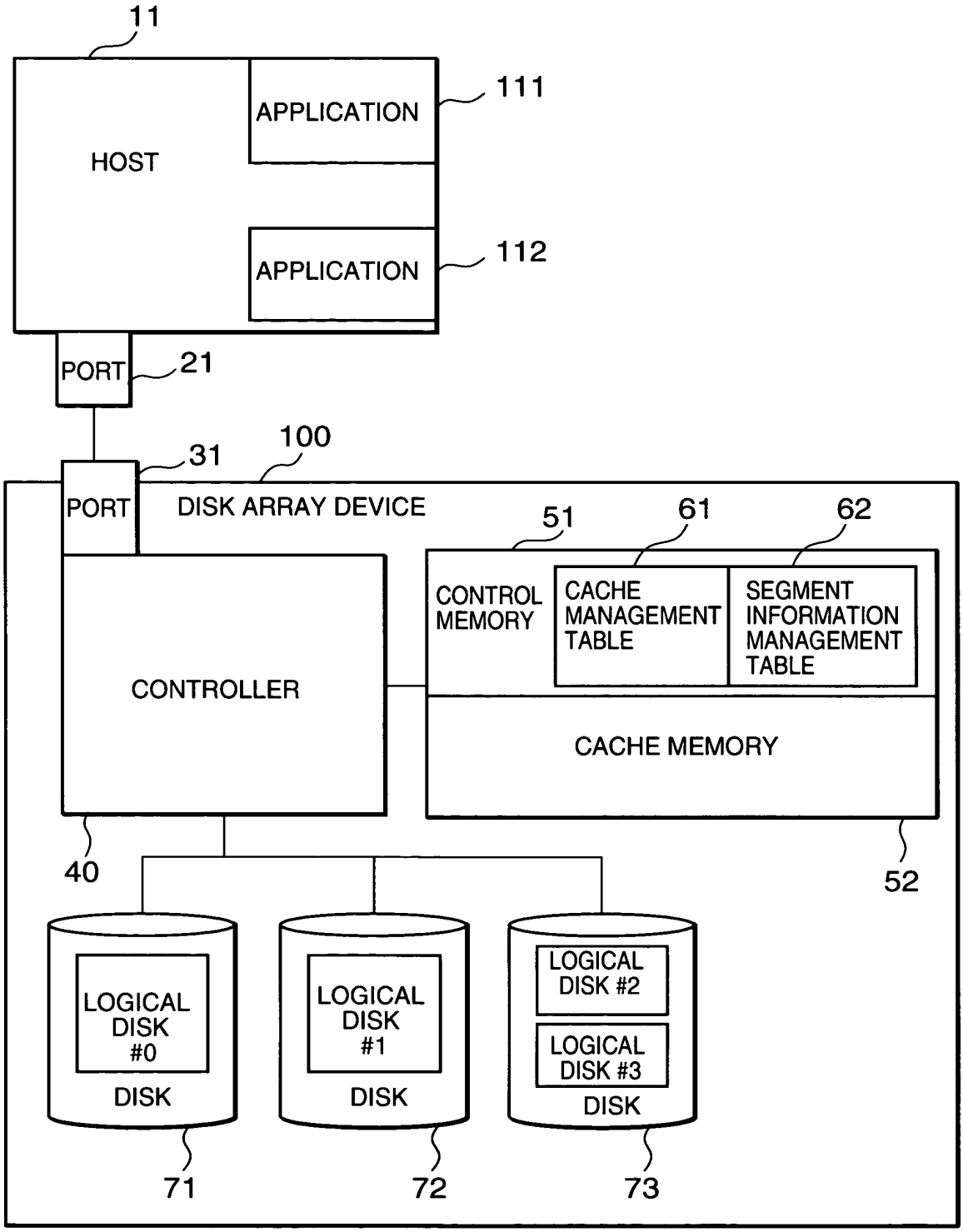
11
HOST
APPLICATION
111
APPLICATION
112
PORT
21
100
31
PORT
DISK ARRAY DEVICE
51
61
62
CONTROL MEMORY
CACHE MANAGEMENT TABLE
SEGMENT INFORMATION MANAGEMENT TABLE
CONTROLLER
CACHE MEMORY
40
52
LOGICAL DISK #0
DISK
LOGICAL DISK #1
DISK
LOGICAL DISK #2
LOGICAL DISK #3
DISK
71
72
73

FIG. 6

62

SEGMENT INFORMATION MANAGEMENT TABLE

| SEGMENT MANAGEMENT TABLE | ALLOCATION CRITERION VALUE |
|---|---|
| CACHE SEGMENT #0 | 70 |
| CACHE SEGMENT #1 | 30 |
| CACHE SEGMENT #2 | 0 |
| CACHE SEGMENT #3 | 0 |

| LOGICAL DISK MANAGEMENT TABLE | CACHE SEGMENT NUMBER |
|---|---|
| LOGICAL DISK #0 | #0 |
| LOGICAL DISK #1 | #0 |
| LOGICAL DISK #2 | #1 |
| LOGICAL DISK #3 | #1 |

FIG. 7

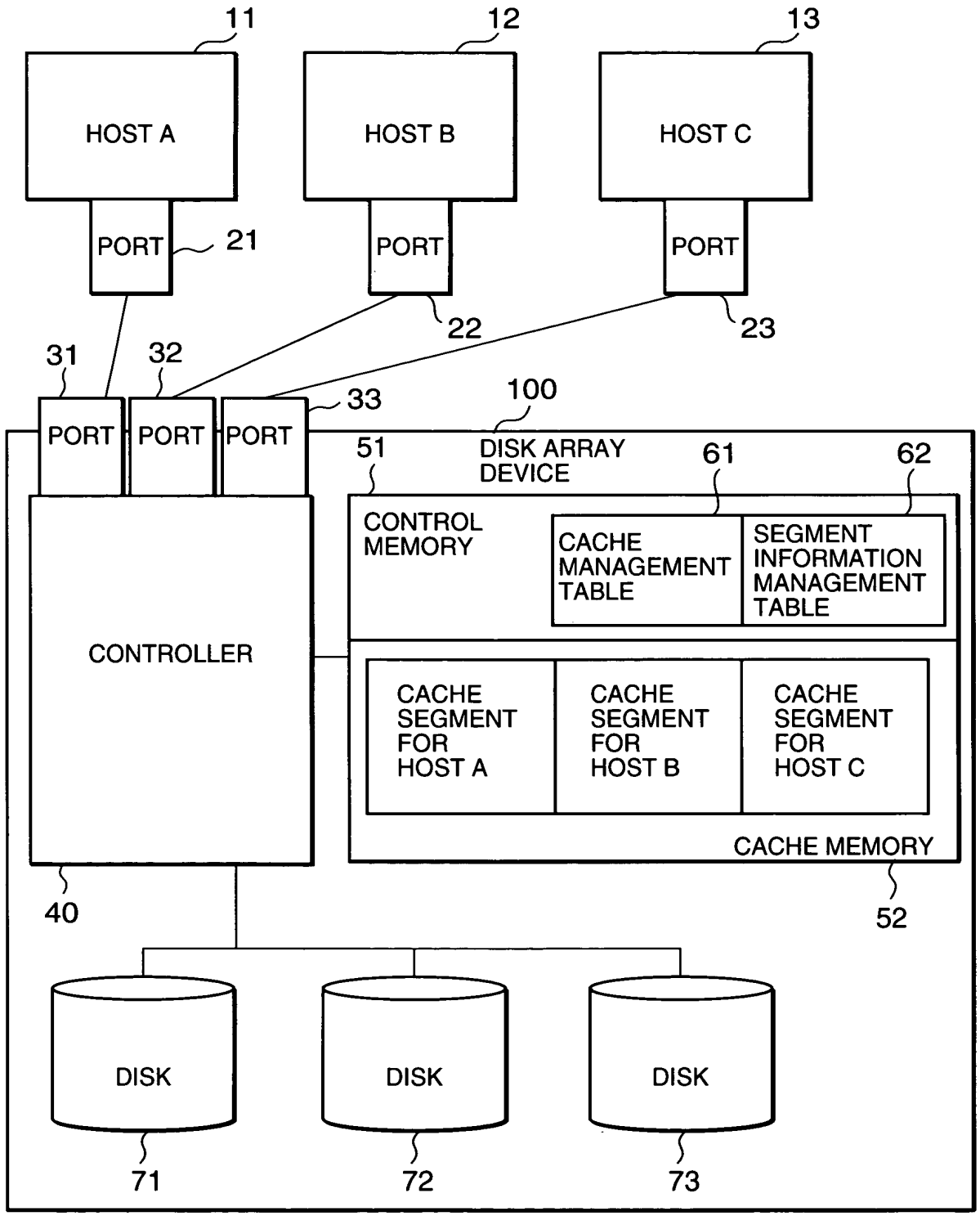
11
12
13
HOST A
HOST B
HOST C
PORT
21
PORT
PORT
22
23
31
32
33
100
PORT
PORT
PORT
51
DISK ARRAY DEVICE
61
62
CONTROL MEMORY
CACHE MANAGEMENT TABLE
SEGMENT INFORMATION MANAGEMENT TABLE
CONTROLLER
CACHE SEGMENT FOR HOST A
CACHE SEGMENT FOR HOST B
CACHE SEGMENT FOR HOST C
CACHE MEMORY
40
52
DISK
DISK
DISK
71
72
73

FIG. 8

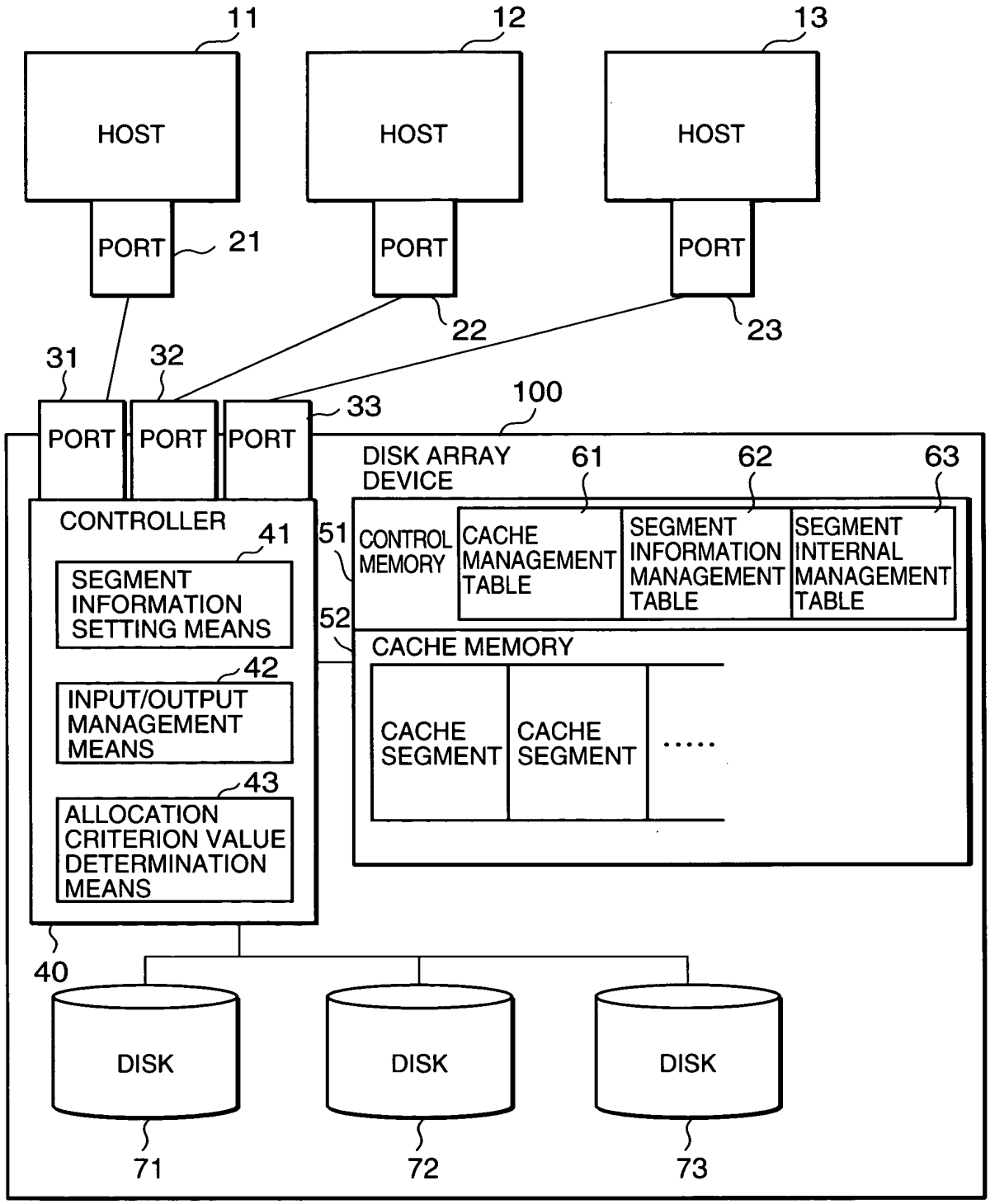
11
12
13
HOST
HOST
HOST
PORT
21
PORT
PORT
22
23
31
32
33
100
PORT
PORT
PORT
DISK ARRAY DEVICE
61
62
63
CONTROLLER
41
51
CONTROL MEMORY
CACHE MANAGEMENT TABLE
SEGMENT INFORMATION MANAGEMENT TABLE
SEGMENT INTERNAL MANAGEMENT TABLE
SEGMENT INFORMATION SETTING MEANS
52
CACHE MEMORY
42
INPUT/OUTPUT MANAGEMENT MEANS
CACHE SEGMENT
CACHE SEGMENT
.....
43
ALLOCATION CRITERION VALUE DETERMINATION MEANS
40
DISK
DISK
DISK
71
72
73

FIG. 9

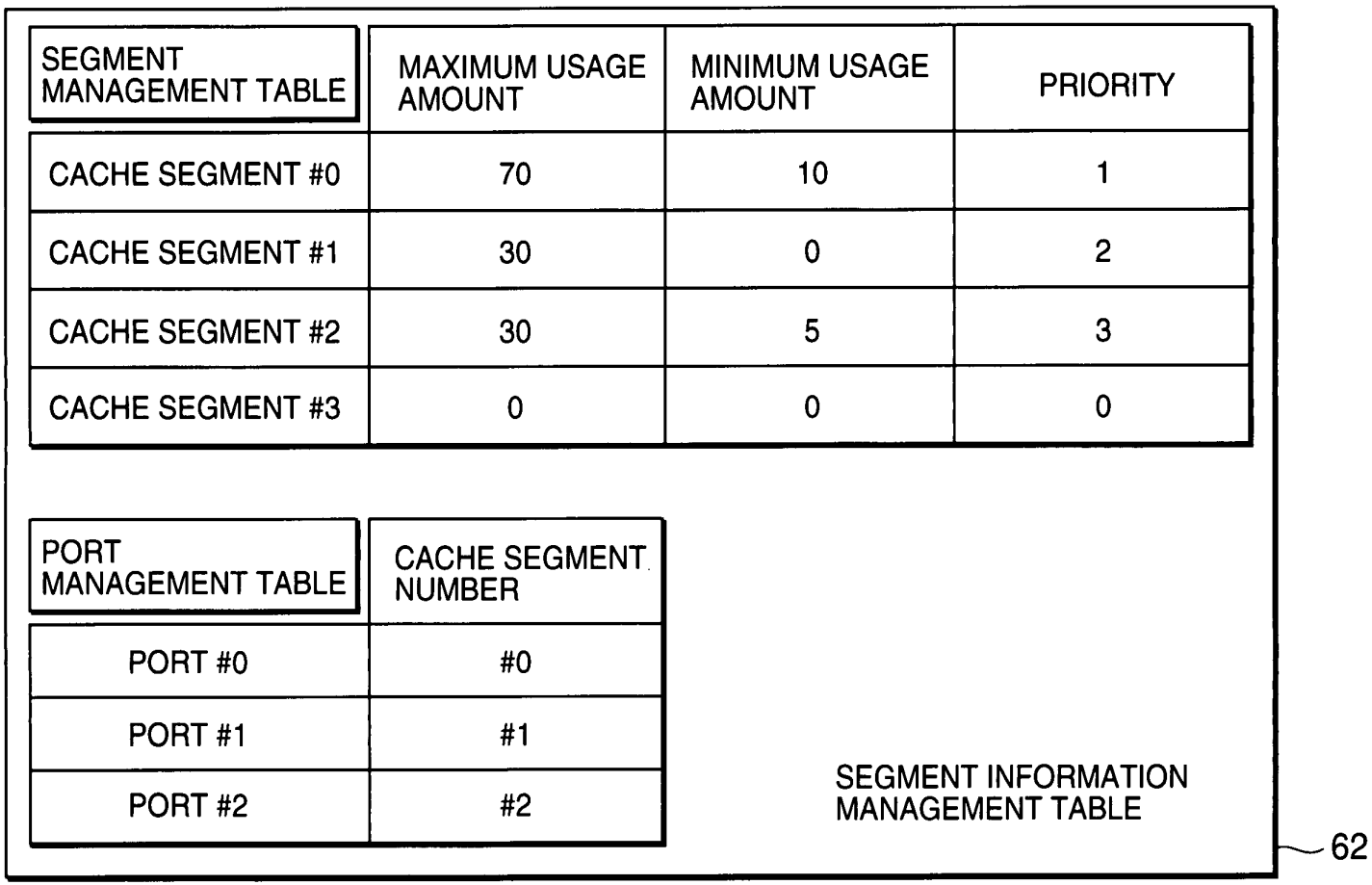
SEGMENT MANAGEMENT TABLE
MAXIMUM USAGE AMOUNT
MINIMUM USAGE AMOUNT
PRIORITY
CACHE SEGMENT #0
70
10
1
CACHE SEGMENT #1
30
0
2
CACHE SEGMENT #2
30
5
3
CACHE SEGMENT #3
0
0
0
PORT MANAGEMENT TABLE
CACHE SEGMENT NUMBER
PORT #0
#0
PORT #1
#1
PORT #2
#2
SEGMENT INFORMATION MANAGEMENT TABLE
62

FIG. 10

63

| SEGMENT INTERNAL MANAGEMENT TABLE | ALLOCATION CRITERION VALUE | ACCESS COUNT | ACCESS LEVEL |
|---|---|---|---|
| CACHE SEGMENT #0 | 54 | 0 | 0 |
| CACHE SEGMENT #1 | 23 | 0 | 0 |
| CACHE SEGMENT #2 | 23 | 0 | 0 |
| CACHE SEGMENT #3 | 0 | 0 | 0 |

FIG. 11A

63

| SEGMENT INTERNAL MANAGEMENT TABLE | ALLOCATION CRITERION VALUE | ACCESS COUNT | ACCESS LEVEL |
|---|---|---|---|
| CACHE SEGMENT #0 | 70 | 100 | 2 |
| CACHE SEGMENT #1 | 20 | 10 | 1 |
| CACHE SEGMENT #2 | 10 | 10 | 1 |
| CACHE SEGMENT #3 | 0 | 0 | 0 |

FIG. 11B

63

| SEGMENT INTERNAL MANAGEMENT TABLE | ALLOCATION CRITERION VALUE | ACCESS COUNT | ACCESS LEVEL |
|---|---|---|---|
| CACHE SEGMENT #0 | 40 | 0 | 0 |
| CACHE SEGMENT #1 | 30 | 10 | 1 |
| CACHE SEGMENT #2 | 30 | 10 | 1 |
| CACHE SEGMENT #3 | 0 | 0 | 0 |

FIG. 11C

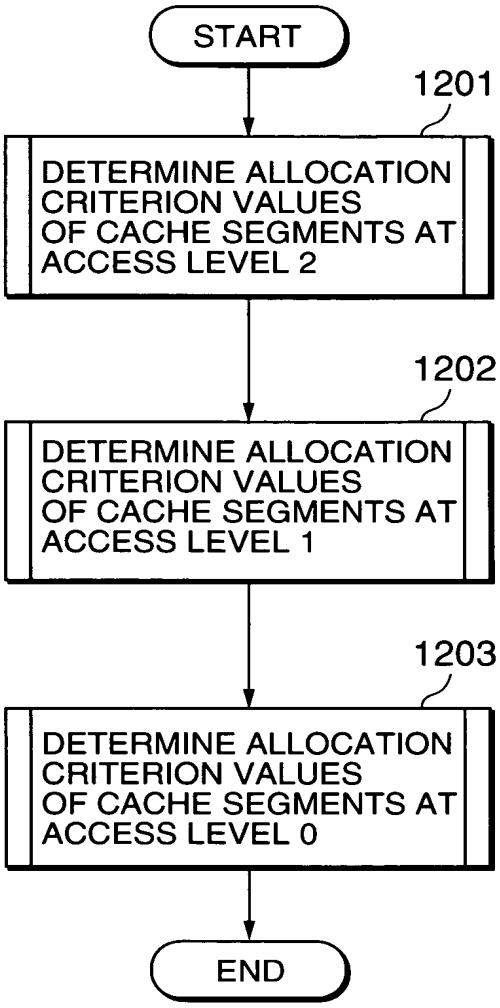
START
1201
DETERMINE ALLOCATION CRITERION VALUES OF CACHE SEGMENTS AT ACCESS LEVEL 2
1202
DETERMINE ALLOCATION CRITERION VALUES OF CACHE SEGMENTS AT ACCESS LEVEL 1
1203
DETERMINE ALLOCATION CRITERION VALUES OF CACHE SEGMENTS AT ACCESS LEVEL 0
END

FIG. 12

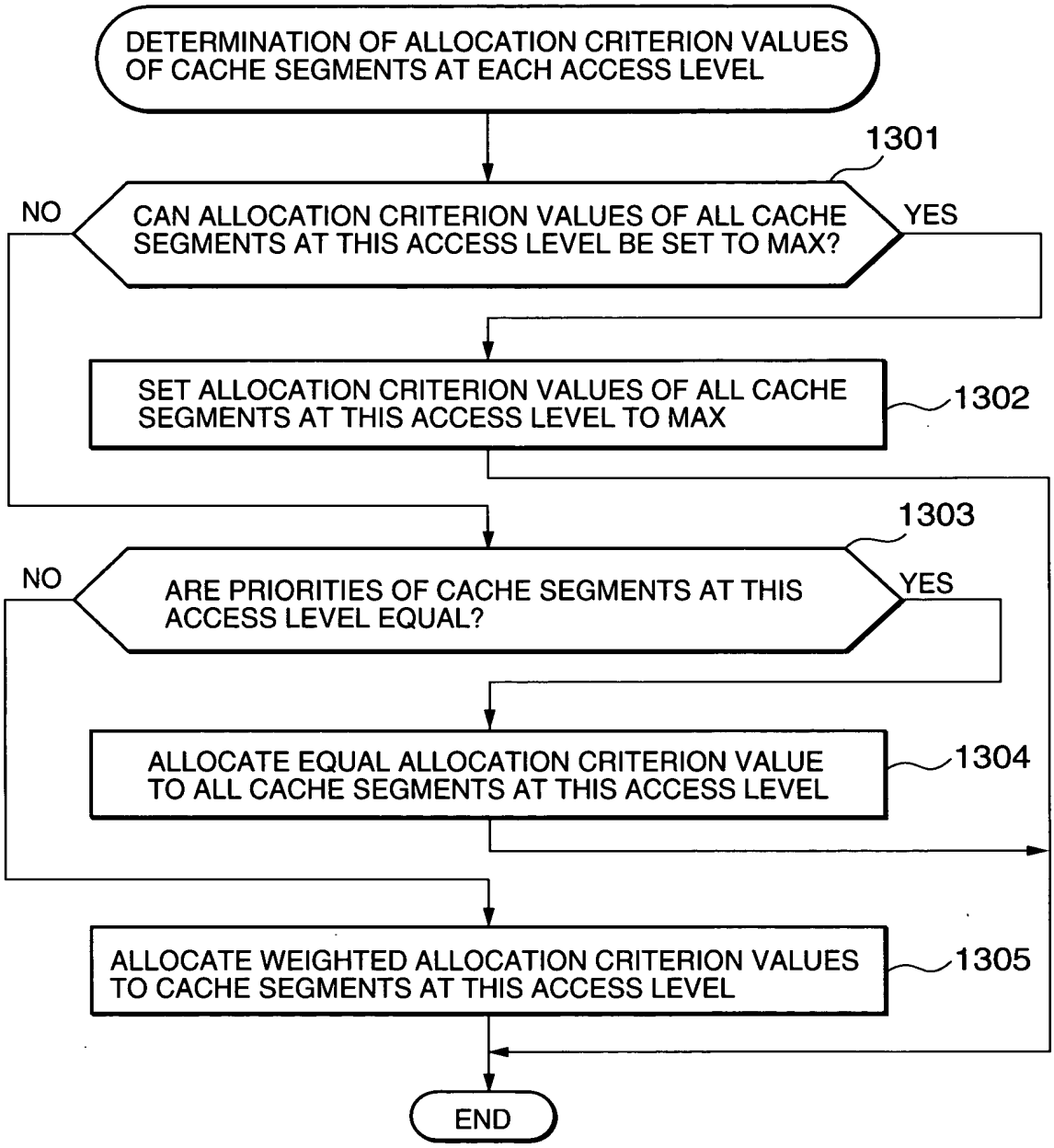
DETERMINATION OF ALLOCATION CRITERION VALUES OF CACHE SEGMENTS AT EACH ACCESS LEVEL
1301
CAN ALLOCATION CRITERION VALUES OF ALL CACHE SEGMENTS AT THIS ACCESS LEVEL BE SET TO MAX?
NO
YES
SET ALLOCATION CRITERION VALUES OF ALL CACHE SEGMENTS AT THIS ACCESS LEVEL TO MAX
1302
1303
ARE PRIORITIES OF CACHE SEGMENTS AT THIS ACCESS LEVEL EQUAL?
NO
YES
ALLOCATE EQUAL ALLOCATION CRITERION VALUE TO ALL CACHE SEGMENTS AT THIS ACCESS LEVEL
1304
ALLOCATE WEIGHTED ALLOCATION CRITERION VALUES TO CACHE SEGMENTS AT THIS ACCESS LEVEL
1305
END

FIG. 13

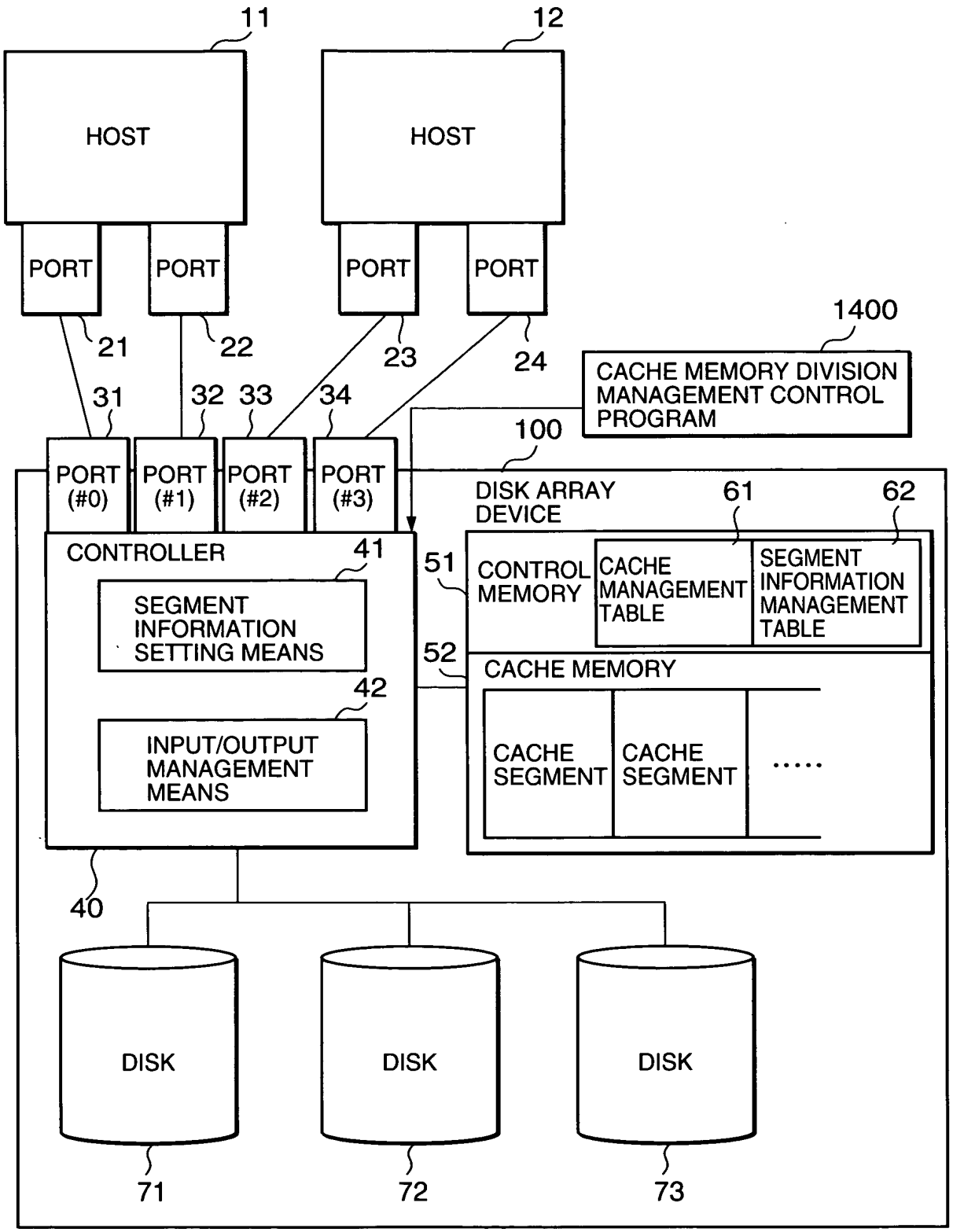
11
12
HOST
HOST
PORT
PORT
PORT
PORT
21
22
23
24
1400
CACHE MEMORY DIVISION MANAGEMENT CONTROL PROGRAM
31
32
33
34
100
PORT (#0)
PORT (#1)
PORT (#2)
PORT (#3)
DISK ARRAY DEVICE
61
62
CONTROLLER
41
51
CONTROL MEMORY
CACHE MANAGEMENT TABLE
SEGMENT INFORMATION MANAGEMENT TABLE
SEGMENT INFORMATION SETTING MEANS
52
CACHE MEMORY
42
INPUT/OUTPUT MANAGEMENT MEANS
CACHE SEGMENT
CACHE SEGMENT
.....
40
DISK
DISK
DISK
71
72
73

FIG. 14

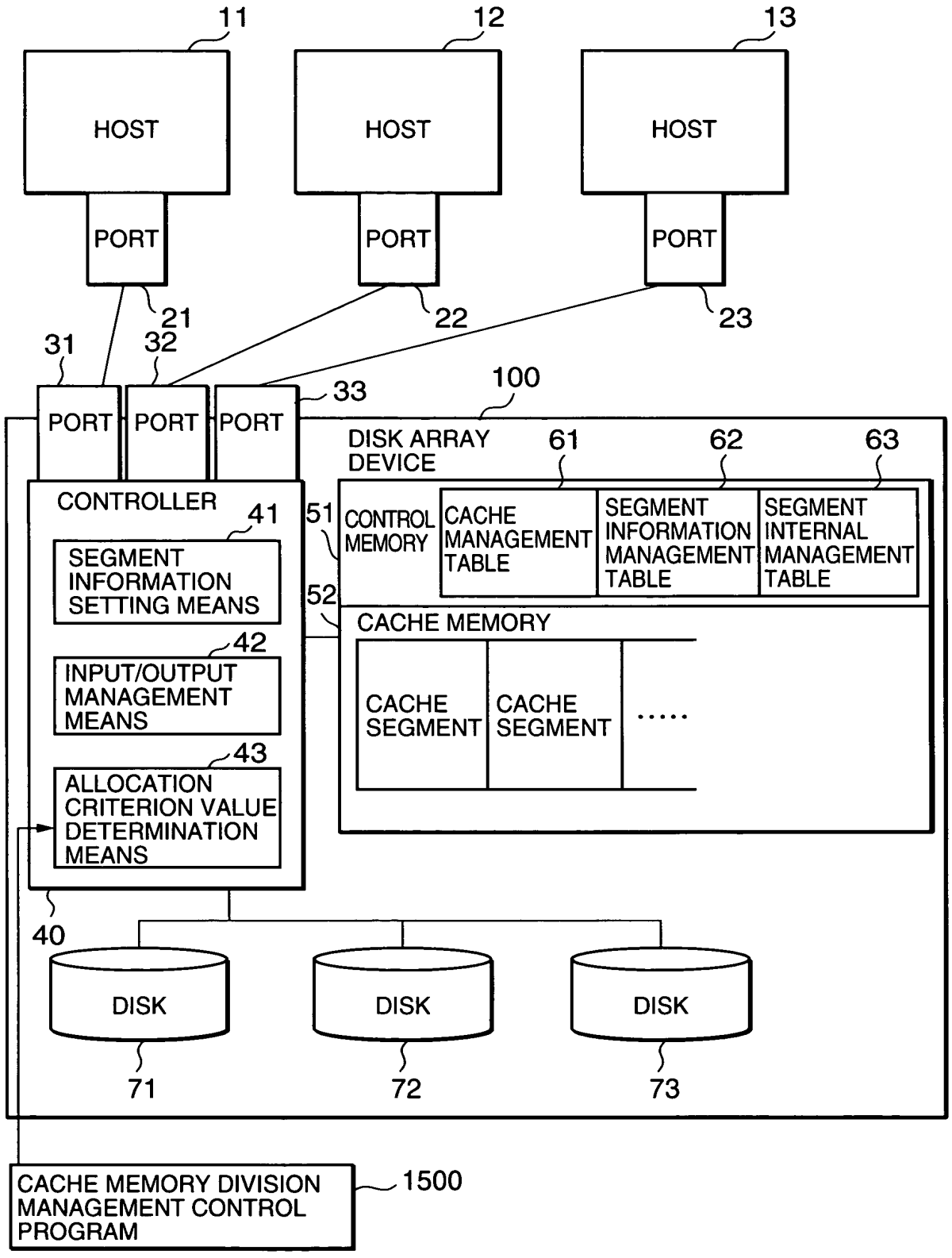
11
12
13
HOST
HOST
HOST
PORT
PORT
PORT
21
22
23
31
32
33
100
PORT
PORT
PORT
DISK ARRAY DEVICE
61
62
63
CONTROLLER
41
51
CONTROL MEMORY
CACHE MANAGEMENT TABLE
SEGMENT INFORMATION MANAGEMENT TABLE
SEGMENT INTERNAL MANAGEMENT TABLE
SEGMENT INFORMATION SETTING MEANS
52
CACHE MEMORY
42
INPUT/OUTPUT MANAGEMENT MEANS
CACHE SEGMENT
CACHE SEGMENT
.....
43
ALLOCATION CRITERION VALUE DETERMINATION MEANS
40
DISK
DISK
DISK
71
72
73
CACHE MEMORY DIVISION MANAGEMENT CONTROL PROGRAM
1500

FIG. 15